

Population Estimates Program

Plans for Producing Estimates after the 2020 Census

Christine Hartley, Ph.D.

Assistant Division Chief for Estimates & Projections

Population Division

Eric Jensen, Ph.D.

Senior Technical Expert for Demographic Analysis

Population Division

2021 CSAC Spring Virtual Meeting

March 18, 2021

**Shape
your future
START HERE >**

United States[®]
**Census
2020**

Annual Estimates Detail

Estimate Type	U.S.	States	Metro/ Micro Statistical Areas	Counties	Cities and Towns	Puerto Rico	Puerto Rico Municipios
Total Resident Population	X	X	X	X	X	X	X
Components of Change (Births, Deaths, Net Migration)	X	X	X	X		X	
Population Characteristics (Age, Sex, Race, Hispanic Origin*)	X	X		X		X	X
Monthly Population (Five Universes**)	X						
Group Quarters Population by Type	X	X	X	X	X	X	X
Housing Units	X	X		X	X		

*For Puerto Rico Commonwealth and its municipios, population estimates are produced by age and sex only.

**The five estimates universes are: resident, resident plus Armed Forces overseas, civilian, civilian noninstitutionalized, household.

Methods

- County-level geographies and above: cohort-component method measuring population change since the last decennial census using the most current administrative records on births, deaths, and migration
- Subcounty geographies: distributive housing unit method to estimate the household population, which is added to an estimate of the population in group quarters
- Housing units: component-based method beginning with the most recent decennial census and measuring change in the housing stock using survey and administrative data

Blending the 2020 Population Estimates Base

- The census typically forms the base for the population estimates
- Research is needed to evaluate the 2020 Census data for this purpose, but the files will not be available with sufficient time
- “Blended base” method: control April 1, 2020 from Vintage 2020 (based on the 2010 Census) to other sources to generate a plausible base
- **Potential data sources**
 - State total population from the 2020 Census invariant populations
 - National age/sex detail from 2020 Demographic Analysis
 - Modeling or external data sources
- **Research is underway to determine the specific logic of the approach**

Beyond Vintage 2021

- **Population Estimates Program (PEP) staff will assess the 2020 Census data to identify potential issues for the estimates base**
- **How to evaluate the 2020 Census:**
 - Coverage measures
 - Estimates Evaluation

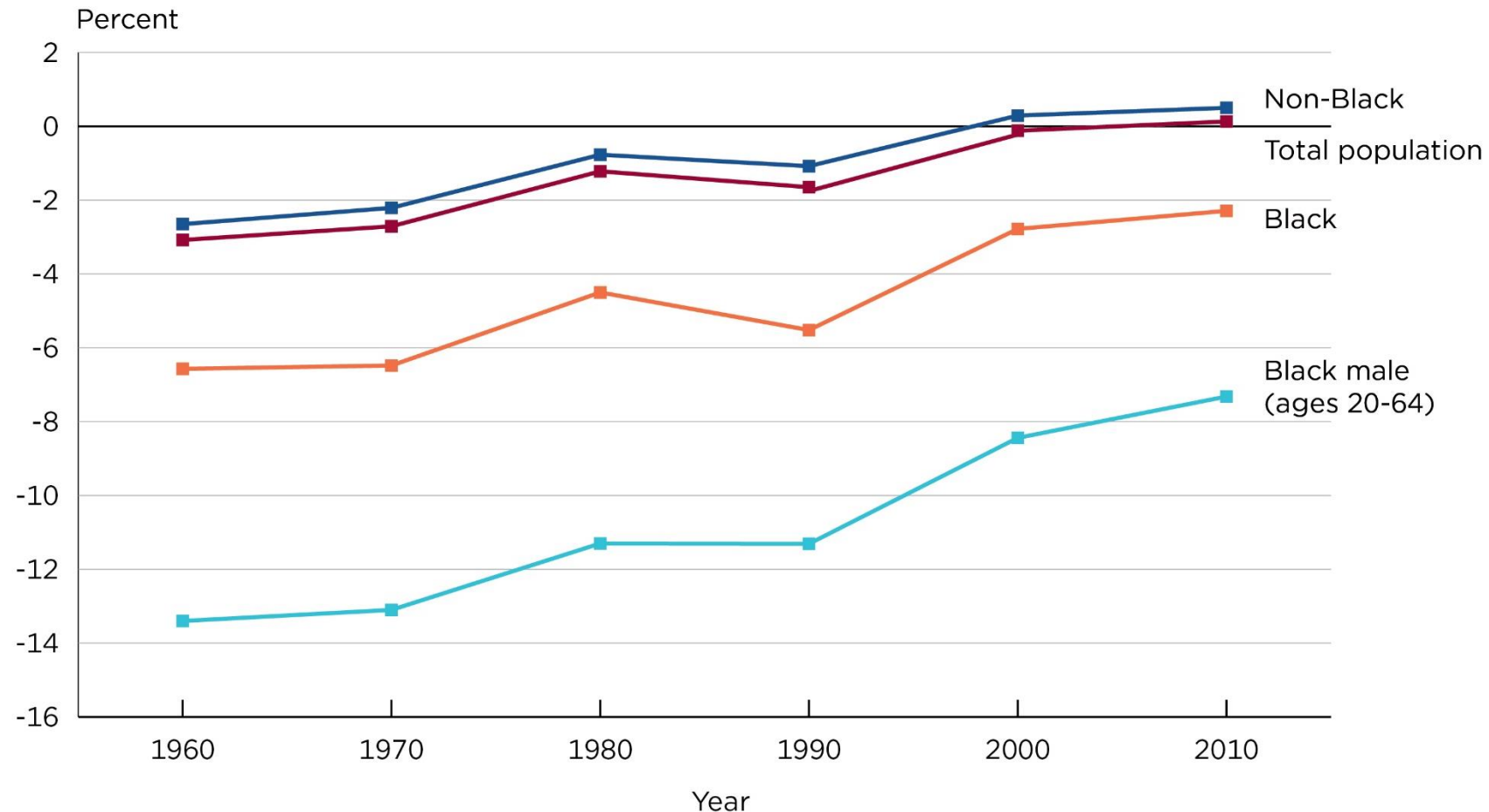
Demographic Analysis

- **Demographic Analysis (DA) is a method that the Census Bureau uses to evaluate the quality of the decennial census**
- **We produced national estimates of the population on April 1, 2020 by age, sex, DA race categories, and Hispanic origin**
- **Estimates are developed using current and historical vital records, data on international migration, and Medicare records**

What Demographic Analysis Tells Us About the Quality of the 2020 Census Results

- **DA can tell us about the net coverage error for specific age, sex, DA race, and Hispanic origin groups at the national level**
- **Net coverage error combines undercounts and overcounts for the same group**
- **The strength of DA is what it tells us about differential coverage for demographic groups either within the same census or over time**
 - Coverage differentials by race
 - Undercount of young children

Demographic Analysis Estimates of Net Coverage Error From 1960 to 2010



Note: Net coverage error is calculated as the percent difference between the census counts and the Demographic Analysis estimates.

Source: U.S. Census Bureau, Population Division, Demographic Analysis Program, Special Tabulation.

Available Detail for 2020

- **Three sets of DA population estimates**
 - Black Alone/non-Black Alone
 - Black Alone or in Combination/non-Black Alone or in Combination
 - Hispanic (ages 0-29 only)
- **National estimates by age, sex, DA race groups, and Hispanic origin**
- **Low, middle, and high series for each set to measure uncertainty**
- **Components of population change for all three sets and series**
 - Births, deaths, international migration, Medicare-based estimates

2020 Demographic Analysis

Estimates of the U.S. Population as of April 1, 2020

LOW

330,730,000

MIDDLE

332,601,000

HIGH

335,514,000

Estimates Evaluation (E2)

- **The annual estimates series are typically based on the latest decennial census**
- **Differences between the Vintage 2020 estimates and the 2020 Census may result from several sources:**
 - Error in the previous census (2010 Census)
 - Estimation error in the components of demographic change (Vintage 2020)
 - Error in the new census (2020 Census)
- **Analyses will be conducted in 2021-2022**
 - Specific timeline is contingent on the internal availability of 2020 Census data files
 - Current focus on reviewing literature from previous evaluations, identifying metrics of interest, and collaborating with state partners

Measures of Difference

- **Error of Closure (EOC)**

$$((\text{Estimate} - \text{Census})/\text{Census}) * 100$$

- **Percent Error: Mean Absolute Percent Error (MAPE)**

$$((\sum(|\text{Estimate} - \text{Census}|)/\text{Census}))/N * 100$$

- **Bias: Mean Algebraic Percent Error (MALPE)**

$$((\sum((\text{Estimate} - \text{Census})/\text{Census}))/N) * 100$$

- **Numeric Error: Root Mean Squared Error (RMSE)**

$$\text{SQRT}(\sum((\text{Estimate} - \text{Census})^2)/N)$$

- **Distribution: Total Absolute Error of Shares**

$$\sum |(\text{Estimate}/\sum \text{Estimate}) - (\text{Census}/\sum \text{Census})|$$

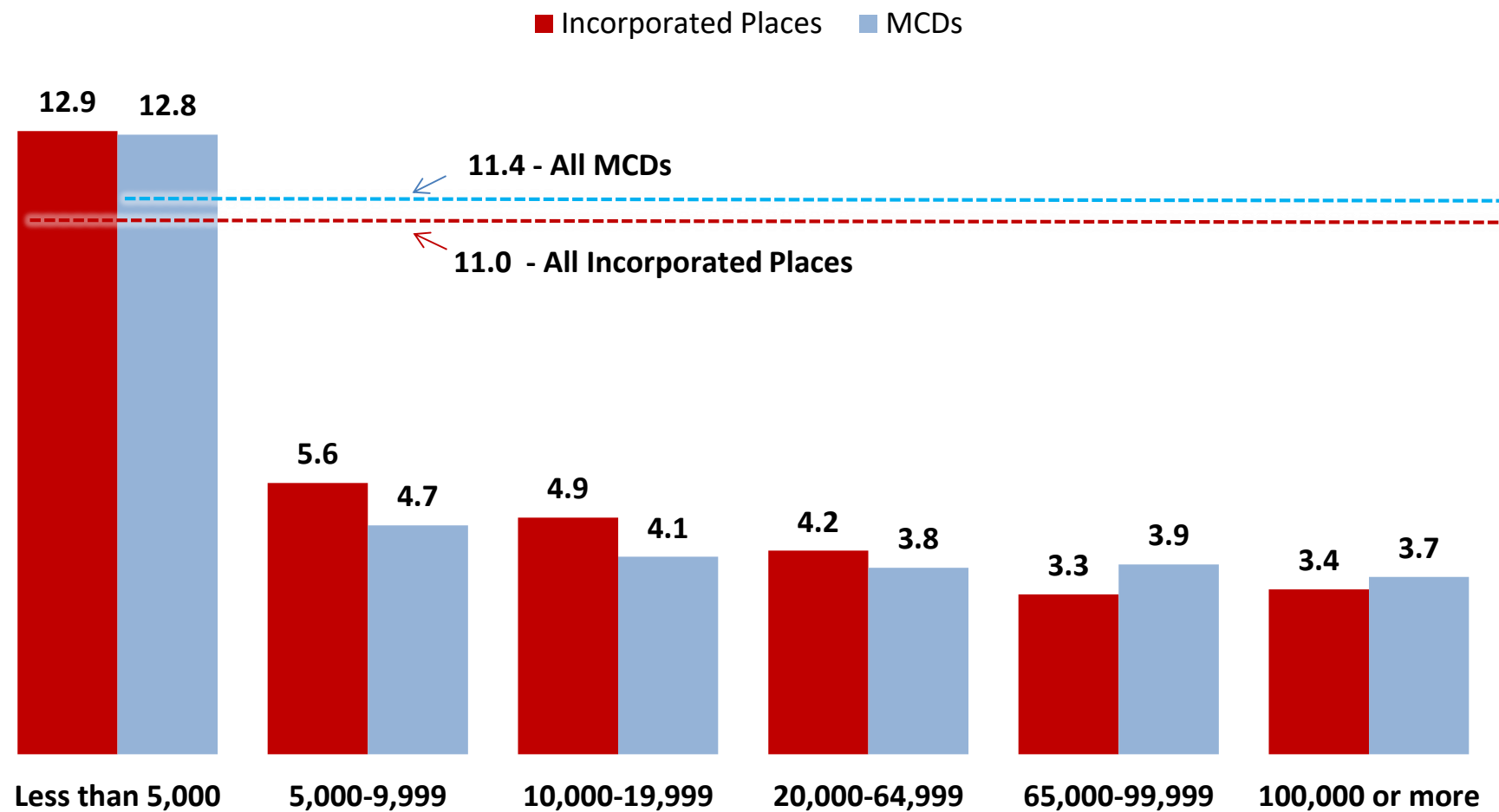
Measures by Level of Geography: 2000 and 2010

Selected Measures of Accuracy by Level of Geography: 2000 and 2010			
Level of Geography	Measure	2000	2010
Nation	EOC	-2.45	-0.10
State	MAPE	2.55	1.02
County	MAPE	3.36	3.10
Incorporated Places	MAPE	12.1	11.0
MCDs	MAPE	12.7	11.4

Note: Error of Closure (EOC) is the percent difference between the population estimate and the census count.

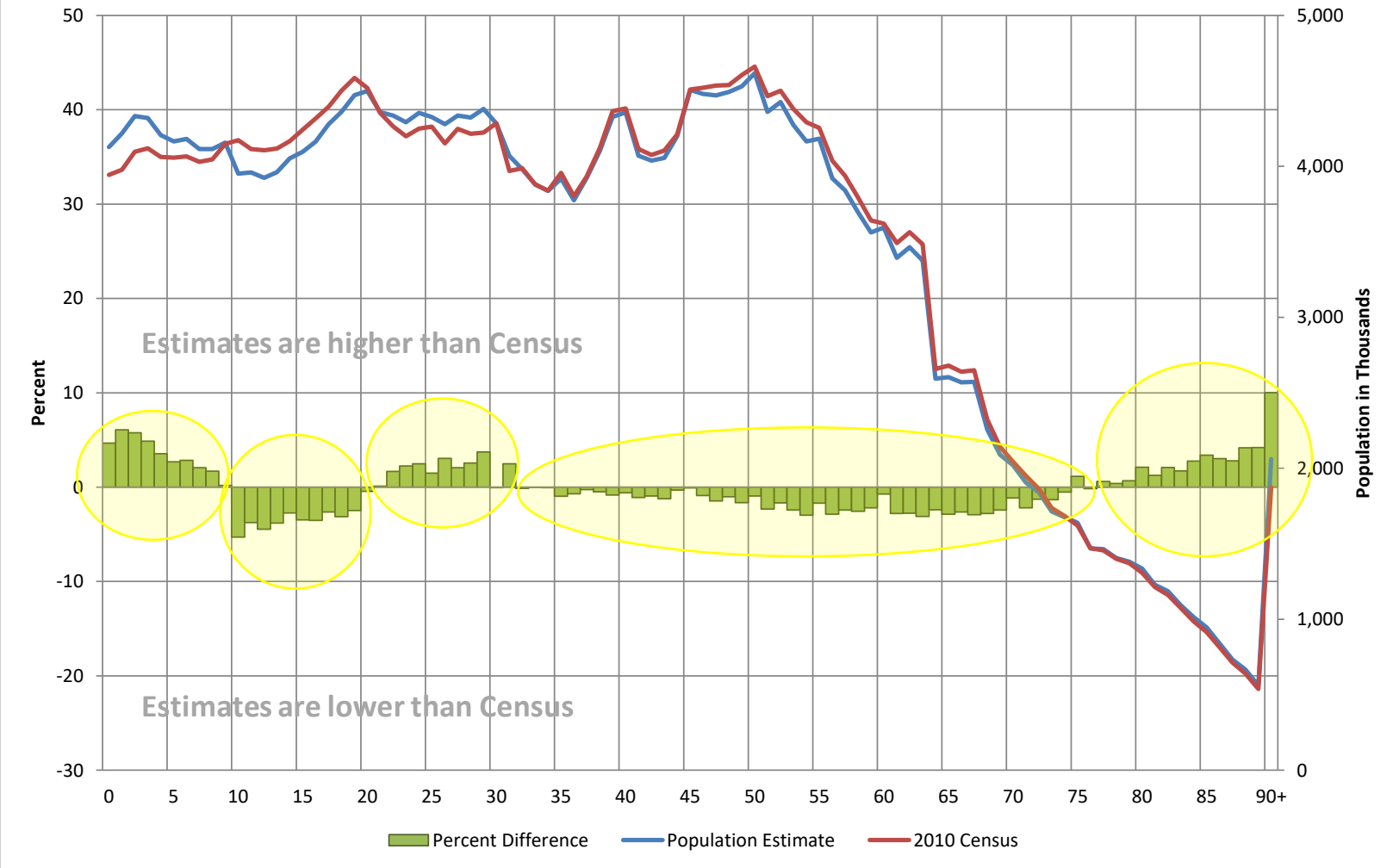
Source: U.S. Census Bureau, Population Division, Population Estimates Program.

MAPE for Incorporated Places and MCDs by Population Size: 2010

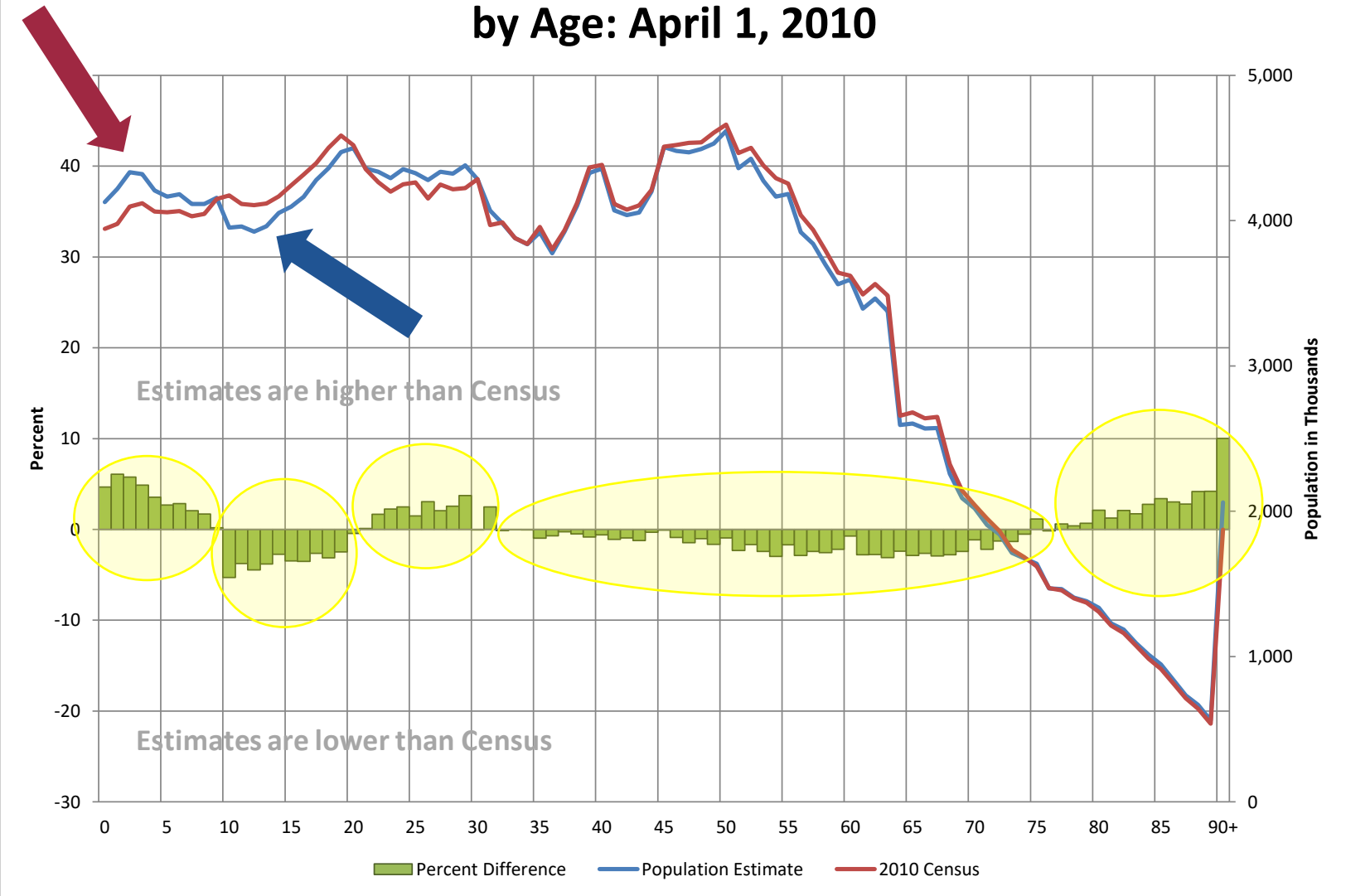


Note: Population size is based on Census 2000 population.
Source: U.S. Census Bureau, Population Division, Population Estimates Program.

Comparison of Total Population by Age: April 1, 2010



Comparison of Total Population by Age: April 1, 2010



Beyond Vintage 2021 (cont.)

- **Evaluations of coverage measures and the results from E2 will help us to determine:**
 - Is the 2020 Census fit for use as the estimates base?
 - Are there specific geographies/characteristics that are concerning?
- **Depending on our findings, the blended base could be extended to Vintage 2022 (and beyond)**
 - This could permit additional time for research and the development and implementation of mitigation strategies
 - Findings from E2 may result in the incorporation of additional controls from the 2020 Census into the blended base
- **Another option is to begin to use 2020 Census data as the base (with differentially private noise infused into the estimates)**

Population Estimates Challenge Program

- **Provides the opportunity for general-purpose governmental units to challenge their official estimates by submitting additional data to the Census Bureau for evaluation**
- **Estimates may be challenged due to:**
 - Technical error in processing input data or producing the estimates
 - Incorrect input data used in the process of generating the estimates
- **Out of scope challenges:**
 - Official Census counts of housing units and group quarters populations
 - Geographic boundary changes
- **This program is suspended and tentatively scheduled to resume in 2022 for the Vintage 2021 estimates**

Challenge Program Guidelines

- **Challenge requests must be received within 90 days after the public release of the estimate**
 - Must include a letter indicating the intent to challenge from the Chief Executive Officer or Highest Elected Official and supporting evidence
- **Data submitted in support of a challenge must be consistent with the criteria, standards, regular processes, and methodology PEP employs to generate the population estimate**
- **Once the challenge has been received, a derivation sheet is provided to the governmental unit containing the components used to create the estimate**
- **The governmental unit then submits data/evidence materials for review by PEP**

County Challenges

- **For counties/statistical equivalents, data may be submitted on one or more of the following:**
 - Births
 - Deaths
 - Facility-level group quarters population
 - Domestic migration
 - Net international migration

Subcounty Challenges

- **For incorporated places and minor civil divisions, data may be submitted related to changes in an area's housing stock, such as:**
 - Residential building permits and non-permitted new construction
 - Certificates of occupancy
 - Housing conversions
 - Demolitions and non-permitted housing loss
 - Mobile home placements
 - Occupancy rates
 - Persons per household
 - Facility-level group quarters population data

Challenge Data Review Process

- **Considerations:**
 - Are the submitted data different from those used to generate the estimates?
 - Is documentation complete?
 - Are calculations correct?
 - Are time periods referenced aligned with PEP's time periods?
 - For housing data: is the locality adequately covered by the survey?
- **Accepted challenges are published on the Challenge Program page of the Population and Housing Unit Estimates Website:** <https://www.census.gov/programs-surveys/popest/about/challenge-program.html>

Summary of Accepted Challenges: Vintage 2018

Area	State	Challenge Acceptance Date	Original 7/1/2018 Population Estimate	Revised 7/1/2018 Population Estimate
Florence town	AZ	2/05/2020	26,419	27,061
Mobile city	AL	2/05/2020	189,572	189,992
Florence city	SC	2/05/2020	37,625	38,065

Potential Mitigation Strategies

- **Revisions to the Population Estimates Challenge Program**
 - Implications of differential privacy
 - Expand scope?
- **Collaboration with Federal-State Cooperative for Population Estimates (FSCPE) Partners**
 - They provide: county birth totals, county death totals, GQ facility-level population
 - They review: state and county totals and components of change; housing unit totals and components
 - Are there ways to maximize our partnership and data sharing?
- **Other stakeholder engagement**

Q&A

Shape
your future
[START HERE >](#)

United States®
Census
2020